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REVIEWS.

Elementary Electricity Taught by Analogy.

Reviewed by HENRY H. NORRIS.*

THE FOUNDATIONS OF ALTERNATE CURRENT THEORY.—By C. V. Drysdale, M. Inst. E. E. New York: Longmans, Green & Co. London, England: Edward Arnold. Cloth; 5¼ x 8¼ ins.; pp. 300; 195 illustrations in the text. $2.50, net.

No student or engineer is so sure of his fundamental theory that he is not pleased to review it from a new point of view. At a recent lecture on the gyroscope the speaker apologized for being somewhat elementary in his treatment of this difficult subject. A listener in the audience was heard to remark, "He need not offer any apology for being elementary." This expressed the state of mind of many engineers, who always learn something when the scientific foundations of their art are freshly presented. Dr. Drysdale has given such a presentation of the elements of electrical engineering under a somewhat ponderous title. The title might give the impression of a formidable mathematical treatment, but the book is really a fresh, vigorous discussion of electrical principles, based upon mechanical analogies. It is, in the early part at least, almost as much a book on mechanics as on electricity.

An important principle in presenting any subject is to base the new conceptions upon old and familiar ones. The art of teaching is a struggle to apply this principle successfully. But the principle goes farther than the class-room. It applies equally well in the shop and the drafting-room, where men have to be taught to carry out the ideas of creative minds. The result is that teaching is, to a considerable extent, a matter of analogy. This is especially true in electrical engineering, where the forces, velocities, etc., seem more mysterious than in mechanical engineering. In the latter, mass motion appeals to the eye. A subject seems easy when one can "see the wheels go round." Dr. Drysdale shows that, fundamentally, electrical quantities are no more occult than mechanical ones, in fact, they are essentially the same. He does this in such an interesting way, taking up the analogies one at a time, that the reader enjoys the discussion much as he would if listening to an illustrated lecture. In fact, the informal lecture style is followed throughout and the illustrations are from apparatus and charts which the author actually uses in his class work. Given a fair preparation in elementary mechanics on the part of the reader, and a habit of observing the ordinary phenomena of every-day life, there is no question but that a good working knowledge of electrical principles will be obtained from a thoughtful reading of the book.

The book is divided into four natural sections: (I.) Fundamental principles; (II.) simple harmonic motion; (III.) alternate currents in connected circuits; and (IV.) mutual and external actions. At the outset the reader is assured of the inherent simplicity of the flow of currents in circuits. This is illustrated by means of a series of analogies between water flow and the electric current. The names of electrical quantities indicate this parallelism. For example, electric *current*, electro*motive force*, electric *pressure*, electric *resistance*, etc. Ohm's law, which expresses the relation of current, electromotive force and resistance, is shown to be like the relation of liquid velocity, head and resistance, or like the relation of the velocity of a solid, the force acting upon it, and the resistance to its motion. As there are several kinds of mechanical resistance which differ in their characteristics it is necessary to select one which is analogous to electrical resistance. Ordinary friction between solids will not answer because it is practically independent of velocity. Resistance to the motion of a body in fluids, being at low velocities practically proportional to the velocity, serves the purpose very well. The author shows the picture of a working model which is used to demonstrate Ohm's law mechanically. The same model is used later in connection with other demonstrations of electro-mechanical analogies. After the discussion of the law of resistance alone, there are chapters on inertia and inductance alone, elasticity and capacity alone, and finally of combinations of the three mechanical, and the three electrical properties, respectively.

Taking a fresh start in Part II., Dr. Drysdale shows how prevalent is harmonic motion in mechanics. In the steam engine, the tuning fork, the pendulum, familiar to every one, the motion which bewilders when observed in the alternating-current circuit is shown to be very simple indeed. Mechanical methods of drawing sine curves prove that there is nothing in this subject beyond comprehension. What a simple mechanical device can do readily ought not to puzzle an intelligent human being. From alternating motion in the steam engine it is but a short step to other alternating quantities. The motion of a dumb-bell in the hand of an athlete is a simple alternating quantity. So also is an alternating current of electricity. Diagrams of electrical quantities represented by rotating vectors are not essentially different from those of mechanics in which ordinary vectors are employed. Thus step-by-step the student is introduced to what he sees is essentially simple until he has a working grasp of the subject before he knows it. He feels that the teacher is urging him continually to observe the analogous experiment until he catches the real principle—and then to turn to the new idea which will, in the meantime, has been grasped unconsciously.

Parts III. and IV. are more strictly electrical, for by the time the reader has caught the lessons taught by the analogies, he is in a position to *think electrically*. Analogies are good as far as they go, but they do not go the entire distance by any means. An engineer should be able to think in electrical terms just as, eventually, a student of a foreign language must think in that language. If he is forever compelled to translate into his own tongue before he knows what the foreign expressions mean, he really never knows the foreign language. So, in electrical engineering, in the end the student must "feel" electrical resistance, inductance, power, etc., independently of analogies in other "languages." Dr. Drysdale evidently has this in mind, for in the preface he explains that he aims to prepare the student for Steinmetz, Hay, Russell, Thompson, and others who do not appeal to analogies, but who write directly in the electrical language.

The foregoing statements give some idea of the scope and plan of Dr. Drysdale book and also something of its spirit. He has carried the "analogy method" farther than other authors; some may say, too far. But he is logical, conscientious and painstaking without being dry, and he shows throughout that his ultimate object is to give the reader a *working knowledge* of the electric circuit. He succeeds in this and, incidentally, the reader finds his conceptions of mechanical phenomena clarified by the reflex influence of the electrical analogies.

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Problems of Agriculture, Commerce, Transportation and Conservation.

HIGHWAYS OF PROGRESS.—By James J. Hill. New York: Doubleday, Page & Co. Cloth; 5¼ x 8 ins.; pp. 333. $1.50, net.

Whatever Mr. Hill writes on the great public questions of the day is worthy of careful reading and thoughtful attention. As might be expected from the title, the volume before us deals with a number of subjects closely related to the work of the engineer. Many of the chapters have been made public previously by means of addresses, or through the pages of recent numbers of "The World's Work."

The book opens with an address entitled "The Nation's Future," which was delivered before the Agricultural Society of Minnesota in 1906. This address seem to entitle the friends of Mr. Hill to add his name to that of others whose names have recently been brought forward as deserving the title, "Father of the Conservation Movement." In fact, Mr. Hill himself says of the address in his introduction:

> It was the first to announce the doctrine of Conservation as a whole, and not an incident of some one occupation; and it sought through this to fix the nation's attention upon the necessary readjustment of industry with reference to our greatest asset, the soil. The eager interest with which the discussion thus opened up was received and taken up by the public, and by the President of the United States, was proof of the need for it and its timeliness.

While this broad claim is doubtless largely true, yet Mr. Hill himself gives credit in this very address to the remarkable little book entitled "Man and the Earth," by the late Prof. N. S. Shaler, of Harvard University (reviewed in this supplement on March 15, 1906). But giving Prof. Shaler proper credit for certain suggestions and facts does not in any way rob Mr. Hill of the credit due him, in turn, for his own forceful presentation in brief and concise form of certain phases of the Conservation of Natural Resources, particularly in this opening chapter, on the agricultural resources of the country.

Closely related to the opening chapter are the two following ones, on "Agriculture and the National Life" and "Farm Methods—Old and New," as is also the concluding chapter, "The Natural Wealth of the Land and Its Conservation." The latter comprises Mr. Hill's valuable contribution to the addresses before the conference of governors at the White House, Washington, in the latter part of 1907.

While describing that portion of the book relating specifically to Conservation, mention should be made of the strong chapter on "The Conservation of Capital," which appears near the end of the volume and which deals forcibly with private and public waste and extravagance, the increases in national, state, and local indebtedness, and in taxation, particularly the taxation of railways.

Before passing to some of the other subjects which are given considerable space, mention may be made of chapters dealing with "Reciprocity with Canada," "Commerce," "The Northwest," and a chapter of particular interest to engineers, "Irrigation and Drainage."

Four chapters deal directly, as do most of the others more or less directly, with one phase or another of railroads. The first of these considers the general subject of consolidations of industrial as well as railroad corporations, and, as might be expected, puts up strong arguments for consolidation, provided the object is the benefit of the joint interests of the industries involved and of their patrons, rather than adding large sums to the wealth of the few by imposing heavy ultimate losses or expenses upon the many.

Three chapters dealing with "The Railroad" alone take up, in succession, Construction and Operation; Financing, Rates and Profits; Legislative Regulation, including in particular what Mr. Hill regards as the limits within which the latter should be held. As a whole, the discussion throughout these chapters, as one would expect from Mr. Hill, are conceived in a broad public spirit; but more consideration might well have been given to the abuses that have been suffered by the public and which have led to what Mr. Hill considers grossly unfair legislation.

Two chapters deal with "Oriental Trade," one from the constructive and the other from the destructive viewpoint. In the first the author traces the course of events which led at the same time to bringing immense quantities of lumber to the East from the Northwest, and to laying the foundations for an immense Oriental trade. The rapid progress of trans-Atlantic trade was brought to a sudden end and its bright future ruined, according to Mr. Hill, through unwise governmental restrictions, particularly the Federal prohibition of combined through railroad and steamship rates to Oriental ports. The author seems to ignore the possibility of serious injustice to shippers to and merchants and consumers in Pacific ports resulting from a much lower railway rate to those points for goods to be shipped abroad than for those which were to be retained in this country. He also overlooks the fact, both here and elsewhere in the book, that the stimulation in exports of food stuffs caused by these extremely low joint rates hastened the time when home production would be insufficient for home consumption and raised the price to the American consumer. This may be all very well for the agriculturist, but is the home consumer to receive no consideration? We are aware that this may be regarded as a wrong way of looking at the subject, in view of the fact that the prosperity of the country depends so largely upon that of its agricultural population.

One important chapter has not been mentioned—the one devoted to "Waterways." Here the author shows very clearly how the waterways and the railways may and should react beneficially, each on the other; and also how the immense recent decline of waterway tonnage is largely attributable to the neglect of everyone concerned to provide proper dock or landing facilities for loading and unloading and for storing water freight. The one marked exception to this has been on the Great Lakes where, as every well-informed person knows, means for loading and unloading vessels have been brought to a high state of speed and general perfection.

Mr. Hill is a strong believer in *deep* waterways, and in wholesale rather than piecemeal construction. If he had his way he would see that waterway improvements were carried out on the trunk-line and branch principle, beginning with and effecting the first before doing much of anything with the last.

A strong point is made by Mr. Hill against heavy bond issues, or for that matter any bond issues at all, for waterway improvements. What he has to say on this subject, as well as his general programme for waterway improvements, is well worth quoting, as follows:

> Look at it merely as a business proposition. The interest on $1,000,000,000 at 4%, if such a sum could be obtained by the issue of bonds at that rate or at any rate, is $40,000,000 a year. The largest demand made by the waterway movement as a whole has been an annual appropriation of $50,000,000; and this is probably more than could be spent judiciously. There is thus only the trifling difference of $10,000,000 a year in actual cost to the public between the policy of cash and that of credit; but by the latter the annual contribution must continue until the enormous principal of the debt is paid, while the former buys something, pays for it, enjoys it and has money in pocket for the next year's labor and the next step forward. The country is perfectly able to provide each year all the funds that can be spent wisely on its waterways in that year and bring in value received. This is its only security against the waste of public resources common to all liberal drafts upon the public credit.
>
> The future of the waterway as a factor in transportation can be injured only by some such folly as the proposed issue of bonds for its improvement. The essentials for developing its highest possibilities are few and simple. For the sake of clearness it may be well to repeat them:
>
> (1) A permanent commission, authorized to expend appropriations in its discretion upon national waterways in the order of their importance.
>
> (2) A comprehensive plan, including the classification of rivers and canal routes according to relative value, and also including such reservoir and slack-water work as may be required to carry each project to success. This plan in its essentials to be adopted by the commission at the outset and adhered to without interference by Congress or any department.
>
> (3) Insistence upon the development of trunk lines first, and upon a depth that will make these real carriers of commerce, able to aid the railroads in their task by transporting bulky freight economically and with reasonable expedition.
>
> (4) A liberal standing appropriation annually for the commission's work until its plans shall have been carried out over the whole country; and a refusal to pledge the nation's credit for a single dollar of this, which is properly our work.
>
> To favor and to labor for such a system even though it should demand local self-sacrifice and the postponement of local desire, is the duty of all of us as good citizens and honest business men. Railroad and waterway, needing each other and both needed by the people, may work together for the good of the people. The transportation problem, which grows and complicates with our growth and with every artificial restriction imposed upon it, may be solved by intelligent anticipation. A deep-waterway movement that shall set for itself this standard will command the support of the people by commending itself to their judgment instead of their greed. It will get rid of local log-rolling and all the brood of those who are "for the old flag and an appropriation." It will complete and make adequate to future needs the whole system of transportation by land and water in the United States. It will place those who succeed in popularizing and establishing it among the most far-sighted statesmen and benefactors of their time.

Mr. Hill is no exception to the general rule that every strong writer or speaker is liable to overstatement of the side of the case which makes the strongest appeal to him. Thus, in the chapter on "Irrigation," he speaks of increases in the actual as compared with the preliminary estimated costs of some of the U. S. Reclamation Service projects as unquestionable examples of the excessive cost of publicly as compared with privately executed work. No hint whatever is given of the fact that there was a heavy rise in prices of both labor and material between the time the estimates were made and the works actually completed.

In very much the same way increases in public debts and expenditures are treated by Mr. Hill as examples of sheer waste and extravagance, quite regardless of the fact that changing conditions of the habits and environments of the people may warrant in large degree an increase in public expenditures which goes far beyond the increase in population. It is, of course, impossible for anyone in a brief address or relatively short chapter to go into detailed examination of all the causes which have contributed to the phenomena physical or economical, which he is discussing. At the same time a few words of judicial qualification may well be used to temper and given reason for passing argument against what the writer or speaker believes to be a grave abuse. There is particular opportunity and need for this in discussing the increase of municipal indebtedness and taxation. No one conversant with the problems incident to concentration of immense populations in small areas can fail to see that municipal expenses must of necessity increase in these latter days at a much higher rate than increases in population. Moreover, the wisdom or unwisdom of municipal or other public expenditures cannot be judged without some means of measuring the results growing from the expenditures. This Mr. Hill and many another able man who has deplored the rapid increase in public debts entirely overlooks.

It seems almost captious to make such criticisms as these in connection with so valuable and able a book as Mr. Hill's "Highways of Progress." We think, however, that what we have said is more likely to stimulate interest in the volume than to drive away a single possible reader, and we trust that not only will such be the case but that the book will have the immense circulation which it deserves. There is every reason to believe that the circulation will be unusually large for a book of the kind, indeed, there is one of the kind in existence. Mr. Hill himself states that the address forming the first chapter "was published nearly a dozen times by individuals, institutions and societies in this and other countries, and has been translated into several languages. We trust that this will yet prove true for the book as a whole.

Governing of Prime Movers.

DIE REGELUNG DER KRAFTMASCHINEN. Berechnung und Konstruktion der Schwungrad des Massenausgleichs und der Kraftmaschinenregler in Elementarer Behandlung. By Max Tolle, Professor in the Technical College at Karlsruhe. Second edition, revised and enlarged. Berlin, Germany: Julius Springer. Leather; 6 × 9½ ins.; pp. 699; 19 plates and 463 text illustrations. 26 marks; American price, $10.50.

This is an enlarged second edition.

Governing of prime-movers, in Prof. Tolle's meaning, includes not merely the speed-regulating actions of the governor but also the elimination of cyclic speed-variation and the counterbalancing of mass to secure steadiness and freedom from vibration. All these subjects are discussed in thorough fashion, of course, with abundant use of algebra.

To begin with, flywheel effect is studied, on the basis of the torque variations occurring in steam and gas engines and the desired limit of cyclic variation of speed. Design of flywheels is discussed incidentally, with numerous illustrations. Then balancing is taken up; pounding at the joints is considered briefly, and then the possibility of balancing by adjusting the crank-pin positions of multi-cylinder engines is analyzed in detail, ending with a discussion of balancing by added weights. In the latter connection, balancing in the locomotive has several pages.

The main part of the work, 300 pages, deals with governors, first spindle and then shaft governors. Inertia governors are treated with special reference to shaft governors, of course; speed-changing governors are also included. This part of the book is thoroughly analytical with regard to stability characteristics and the effect thereon of different linkages, loading, and spring tension. But all the makes of governor mentioned are also described fully, with excellent drawings.

Finally, some 150 pages treat of indirect or pilot governors, like those of hydraulic turbines. Only two or three governors are described here, and the author deplores a tendency in this field to maintain "trade secrets." The analysis of the subject is very full, however.

In its descriptive part the work refers mainly to German devices. The analytical treatment of course is not restricted to local value.

BLUE BOOK.—[Reinforced-concrete beam tables.] Prepared by Wm. Barclay Parsons Consulting Engineers, for Pittsburgh Steel Products Co., Pittsburgh, Pa. Published by the company. Leather; 4½ × 6½ ins.; pp. 397.

As a trade publication this volume is remarkable enough to merit a place among books, just as many concrete men, architects and engineers will no doubt keep it on their reference book shelf. It contains a very elaborate set of T-beam tables, by far the most extensive of any that has come to our notice. They are applicable to other reinforcement than that sold by the company which issues the book, though naturally somewhat handier when this special type is to be used. For example, the main sets of tables give the reinforcement required for given spans, spacings, etc., by stating the requisite number and size of "frames" of this system, but a separate table gives the cross-sectional area of metal which these frames contain, so that by double entry a result of general application is obtained.

An idea of the elaborateness of the calculations for this book may be had by noting that the two main tables occupy 134 and 59 pages respectively, and cover T-beams for slabs from 3 ins. to 6 ins. thick, beam spans up to 30 ft., floor-loads from 40 to 400 lbs. per sq. ft., and total loads up to 340 tons. There are other tables for rectangular beams, lintel widths, column loads and reinforcement, floor-slab capaci-

ties at different concrete and steel stresses, etc., besides numerous pages of general information, making in the aggregate a prodigious amount of useful matter.

Industrial Accidents and Employer's Liability.

WORKS ACCIDENTS AND THE LAW.—By Crystal Eastman, Member and Secretary, New York State Employers' Liability Commission. The Pittsburg Survey, Findings in six volumes. Edited by Paul Underwood Kellogg. New York: Charities Publication Committee. Cloth; 6 x 9 ins.; pp. 331; numerous plates and text illustrations. $1.50; postage 15 cts. extra.

Within the past few years a small portion of the people of the United States have begun to realize that the burden of disability or death due to industrial accidents still falls almost wholly upon employees in this country, although placed clearly and unavoidably upon employers, and thus upon the industry itself, by most of the other important industrial nations of the world.

This somewhat slowly dawning realization has been spread and deepened quite recently by careful studies of industrial accidents and the general subject of employers' liability in several states. The earliest of these studies was carried out in 1907-8 at Pittsburg, Pa., as a part of the Pittsburg Survey. Subsequently, state commissions for the study of employer's liability have been created in Minnesota, Wisconsin and New York.

The book before us is devoted primarily to a detailed study of 526 fatal work-accidents and to many non-fatal accidents in Allegheny Co., Pa., which occurred in the year ending June 30, 1907. The volume also contains an important study of the law of employers' liability, with special reference to Pennsylvania and with elucidations drawn from the Allegheny Co. study.

A searching investigation of the cause of each accident was made, and the results recorded on blanks devised with great care for that purpose. In the case of deaths, the records of coroners' investigations were first examined. Subsequently inquiries were made at the home of the deceased and, where possible, at the industrial establishment where death occurred, and at other places where there was hope of securing reliable information.

The book is divided into three main parts and supplemented by a dozen appendixes. Part I. deals with "The Causes of Work-Accidents." A general survey of "Pittsburg's Yearly Loss in Killed and Injured" is followed by a study of fatal accidents among railroaders, soft-coal miners, steel workers and employees in various other industries. A separate chapter is given to the "Personal Factor in Industrial Accidents." The final chapter of Part I. contains suggestions for prevention.

Part II., "Economic Cost of Work-Accidents," takes up in succession the "Distribution of the Burden of Income Loss," "The Effect of Industrial Fatalities Upon the Home," "Problems of Injured Workmen," and the "Policy of Certain Companies" in dealing with accidents to employees.

These two parts, together with the first appendix—"The Temper of the Workers Under Trial"—abound with sympathetic accounts of accidents and their consequences to the person injured and those dependent upon them. They also abound with keen analyses of the accidents in relation both to their cause and the division of responsibility for them between employers and employed.

Part III. deals with the broad subject of "Employers' Liability," largely from the legal viewpoint. The law of the subject is given a close critical examination, presented, however, in a thoroughly readable form to anyone not conversant with legal terms. The author traces most interestingly the way in which the law was gradually developed so as to place the greater part of the risk of accidents upon workmen. This portion of the book deserves close attention by all who wish to see greater justice done to employees. Here, as elsewhere, the author shows clearly how the present generally prevailing system of settlement of claims on account of injured or killed workmen results in payment by the employer of only a small part of damages actually incurred by the injured person, at the same time breeding much bad feeling both between employer and employee. The remedy suggested for this and other ills is legislation which will make the damages due to industrial accidents a charge upon the industry, instead of being borne almost wholly by the person injured.

Among the appendixes we may note those giving measures for safety to workmen adopted by the United States Steel Corporation, from the pen of Mr. David S. Beyer; extracts from the first report of the New York State Employers' Liability Commission; the full text of the recent Accident Insurance Act of Montana (which, however, applies to workmen employed in coal mines and at coal washers, only); and the relief plans of the United States Steel Corporation and the International Harvester Co. and associated companies.

In conclusion, we trust we have made it clear that this volume is an important contribution to exact knowledge on a subject which demands serious attention in this country, if justice is to be done to hundreds of thousands of workmen and if the United States is soon to approach the position already taken by foreign countries in safe-guarding the lives of industrial workers, and in properly compensating them or their families for injuries received while at their posts.

ENGINEERING CHEMISTRY.—A Manual of Quantitative Chemical Analysis for the Use of Students, Chemists and Engineers. Fourth edition. By Prof. Thomas B. Stillman, M. Sc., Ph. D. Easton, Pa.: Chemical Publishing Co. London, England: Williams & Norgate. Cloth; 6 x 9 ins.; pp. 744; 174 illustrations, mostly in the text. $5.

Prof. Stillman's very practical book preserves in its fourth edition, all the desirable qualities of previous editions and exhibits some slight improvements. It is now more than a reference text on the chemistry of waters, fuels, cements, stones, metals, ores, oils, paints, etc., it is a guide for the analysis of these engineering materials to determine, before use, their probable behavior and acceptability for work in hand. Specifications, defining accepted standards to which good materials should conform, have been inserted wherever possible. This edition shows revision of those parts relating particularly to the technology of fuel, metals, oils and paints, and to water softening and pyrometry.

Prof. L. P. Kinnicutt, in reviewing the third edition of this book (Eng. News, Nov. 16, 1905, p. 532), very mildly criticised the omission of specific directions for sampling, the claim being, of course, that the real value of an analysis depends on first securing a characteristic sample. Prof. Stillman has to a large extent supplied this omission and the reader can here get a useful summary of sampling methods applicable to coal, iron ores, pig iron, cement and a few minor materials. A few omissions, however, are made more noticeable by their isolations. With all the attention given to the value of boiler flue-gas analyses there is little said about methods of securing and storing such gas samples; there is also nothing about securing and transporting water samples.

In the few cases where interpretation of the results of chemical analyses were needed and lacking, an attempt seems to have been made to supply the want, as for instance, in the sanitary analysis of water where the actual chlorine, ammonia, nitrate and nitrite contents of various classes of water are given.

THE WELLBEING OF WATERLOO.—A Report to the Civic Society of Waterloo, Iowa. By Charles Mulford Robinson. [Address the author, Rochester, N. Y.] Stiff paper; 6 x 9 ins.; pp. 39; two maps and numerous text illustrations.

Mr. Robinson's report on the improvement of Waterloo is along the same general line as has been followed by him and others in dealing with the same subject for many cities and towns of late. The greater part of the report is occupied with suggestions for improvements of an everyday practical character, designed to contribute to the comfort and convenience of the users of the streets and public places of Waterloo. After disposing of "Some Shortcomings," such as re-

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moval of poles and wires and defects in various minor street conditions, suggestions are made regarding a city hall site, improvements of railway stations and surroundings, making the most of the river front, and various improvements to the park lands which the city has already provided in comparatively liberal area.

A German Pocket-Book for Metallurgists and Rolling-Mill Men.

HUETTE.—Taschenbuch für Eisenhüttenleute. By Akademischer Verein Hütte E. V. Berlin, Germany: Wilhelm Ernst & Sohn. Cloth; 4½ × 7 ins.; pp. 946; 610 text illustrations. Cloth, 15 marks; leather, 16 marks; American price, $6.00 and $6.40, respectively.

The widely known and excellent pocket-book for engineers long published by the "Hütte" society and called by its name, is now supplemented by a similarly-named work designed for metallurgists and rolling-mill men. The new book is of high grade, as might indeed be expected. It was prepared by the collaboration of several dozen of the best authorities in their respective branches, the same method followed successfully in the case of the older "Hütte." In substance, the work is equivalent to a synoptic condensation of a number of text-books, but with fuller treatment of practice. The work of the several co-authors seems to be of high order, but often limited by space. On a general survey, the allotment of space to the various parts of the subject appears fairly satisfactory, but in this regard it will be inevitable that the requirements of users will necessitate extensive additions, and the expansion of some parts with compensating reduction of others.

The particular adaptation of the work to the individual reader's needs is to be judged from the following brief statement of contents: Physical laws and properties, etc., 36 pp.; pyrometry, 8; cooling curves and alloying, 19; metallography, 15; influence of various elements on iron, 36; chemistry and chemical analysis (general, ores, pig, stone, coke, clay, etc.), 63; fireproof substances, 13; crystallography and mineralogy, 30; mechanical testing and specifications, 70; fuels and combustion, 34; furnace materials, 9; gas producers, 8; coke production, 38; boilers, 16; engines and turbines, 17; gas engines, 22; electrical machinery, 16; blowers, conveyors, breakers, etc., 32; pig-iron production, and mixers, 54; puddling, 9; basic Bessemer, 21; open-hearth, 23; crucible steel, 8: electric steel, 14; foundry and malleable practice, thermit, steel casting and baby Bessemer practice, 57; rolling-mills and auxiliaries, 64: roll engines and motors, 14; heating furnaces, 20; roll design, 42; mill operation, 41; pipe welding and rolling, 13; wire, mesh, etc., 16; forging and pressworking, 16; statistics and tables, 35.

FLYING MACHINES: CONSTRUCTION AND OPERATION.—A Practical Book Which Shows, in Illustrations, Working Plans and Text, How to Build and Navigate the Modern Airship. By W. J. Jackman, Author of "A B C of the Motorcycle," etc., and Thos. H. Russell, Charter Member Aero Club of Illinois, Author of "History of the Automobile," etc. With introductory chapter by Octave Chanute, President Aero Club of Illinois. Chicago, Ill. The Charles C. Thompson Co. Cloth; 6 × 8 ins.; pp. 221; numerous illustrations. Cloth, $1; leather, $1.50.

As the introduction of this book Mr. Chanute has written an interesting though brief history of the development of the modern aeroplane from the early gliding models of Wenham, Stringfellow, Lilienthal and Chanute.

If anyone is qualified from personal work in this field to write such a brief foreword surely it is Mr. Chanute, and his statements concerning the work of other pioneers beside Lilienthal gives them credit which they have not received in the recent past. The other authors of the book, after this foreword, proceed to illustrate some of the mechanical actions on which an aeroplane depends for its operation. Then they briefly review the different types of heavier-than-air machines and plunge immediately into the construction details. First the reader is shown how to make a "glider" and he is given some hints and general instructions on learning to soar. It is intimated that the use of such a glider is necessary in the proper training of a first-class aviator that he may gain confidence and ability before using a machine which is power driven. Later on, the authors show how to make an engine-driven biplane flyer similar to but larger than the glider.

If the reader thinks that this book will enable him for a trifling sum to make a machine equal in power to those which have figured in sensational flights recently he will be mistaken. It is emphasized throughout that the construction requires the finest of materials and workmanship and the costs are stated conservatively. For instance, the simple glider first described would cost the amateur some $70, and the engine-driven biplane would cost him at least $750 and might run up to $1,500. The text is clearly written and should be understood by anyone with the capabilities of an ordinary mechanic.

The peculiar features of many prominent designs are illustrated and discussed as to their effect on the rest of the design.

DER VOLLWANDIGE ZWEIGELENKBOGEN.—Entwurf. bauliche Ausbildung und Berechnung des Zweigelenkbogens, seiner Fahrbahn und Widerlager. By K. Brabandt. Berlin, Germany: Wilhelm Ernst & Sohn. Paper; 7 × 9½ ins.; pp. 66; 83 illustrations in the text. 4.80 marks; American price, $2.

Railway crossings over highways, says the author, are so well suited to the use of solid-rib steel arch spans that a special monograph on the design of this type of structure is desirable. He has therefore supplied such a monograph. The applicable theory is detailed in the second half of the book, while the first half discusses the practical features of design. Since skew crossings are frequent in the field to which the work refers, special attention is given to the questions of general arrangement and design which arise in skew spans, as well as to the modification of the computations required because of the unequal load distribution likely to occur in them.

THE REGULATION OF LAKE ERIE.—Report of the International Waterways Commission, with a Discussion of the Regulation of the Great Lakes System. Buffalo, N. Y.: The Commission, Office of American Section. Pub. Doc. Paper; 6 × 9 ins.; pp. 169; tables; 29 plates.

As noted in Engineering News, Jan. 6, 1910, p. 26, the International Waterways Commission, after an investigation and study of the question extending over some years, has reported against the project of regulating the level of Lake Erie by means of a submerged dam and sluice gate at or near Buffalo. At the same time the Commission reported that it may be possible to improve or maintain the level of the lake by some "compensating" work such as a submerged dam in the Niagara River above the Falls, so that the beneficial effect of the river as a safety-valve during storms would be lost, as it would be if crossed near Buffalo by a dam. The study for this river dam is now being made and a full report will be made later. Meanwhile, the report noted above in the head-piece contains the detailed investigations of the Commission and the conclusions from those investigations. Accompanying the report are a great number of the hydrological tables and curves,, giving data on the stages of the Lakes and their tributaries and outlets for nearly 50 years.

THE CONSTRUCTION OF CONCRETE FENCE POSTS.—Farmers' Bulletin 408, U. S. Department of Agriculture. Prepared by the Office of Public Roads. Washington, D. C.: Pub. Doc. Paper; 5¾ × 9 ins.; pp. 31; nine text illustrations.

The dozens of companies that have been formed in the past year or two to manufacture forms for concrete fence posts and to exploit their use is sufficient evidence of the popularity of this recent substitute for one of the minor, though widespread, uses for wood. The bulletin noted above, then, is a recognition by the government of a growing and useful industry. Avoiding carefully all reference to any patented devices the booklet describes in some detail, such constructions of concrete fence posts as can be readily applied with ordinary tools and materials by the average farmer. It should have considerable educational value.

It is a minor matter, perhaps, but we should like to know why the Bureau of Public Roads goes against all technical usage to give governmental sanction to the word "reenforce." "Reenforced concrete" is a layman's word, not an engineer's.

More Than Half Rewritten

for the last two editions

Of the remainder,
about half consists of tabular
and other matter of permanent value

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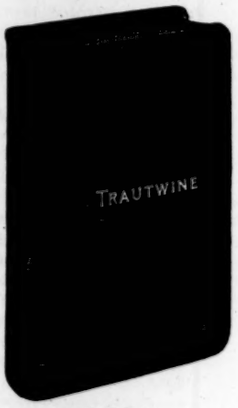

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Included in the large amount of useful and interesting information regarding the new Commonwealth of Australia is a considerable amount of information regarding water conservation and irrigation, roads and railways, mines and mining and manufacturing industries. New sections have been included on public hygiene and state aid to mining. Local government in the various states composing the Commonwealth is taken up in some detail. Brief descriptions are given of the water-works and sewerage systems of the leading municipalities.

A New Edition of Stodola's Dampfturbinen (Steam Turbines.)

DIE DAMPFTURBINEN.—Mit einem Anhang über die Aussichten der Wärmekraftmaschinen und über die Gasturbine. By A. Stodola, Professor at the Eidgenössischen Polytechnikum in Zürich. Berlin, Germany: Julius Springer. Cloth; 7¾ x 11 ins.; pp. 708; 856 text illustrations. 30 marks. American price, $12.

The lapse of five years since the third edition of Stodola's excellent work—the first three editions having appeared within a year and a half—gave large opportunity for working over the whole field anew.* In the same period much change has occurred in the field of steam-turbine manufacture, a selective evolution of types and an extensive perfecting of constructive forms and details. Experimental investigation also brought many new results, and the processes of design have taken these into account very largely. The general aspect of the field thus is more or less thoroughly changed. Prof. Stodola has recognized this state of affairs in conscientious, painstaking manner, by a revision which is in substance a complete rewriting of the work. The present edition is just about twice the size of the third, both in volume of text and in number of illustrations, at the same time retaining fully its conciseness of language and its directness of treatment. The new edition not only maintains but even increases the author's unique standing in the field of steam turbines.

The nature of the work can be described briefly by the statement that every engineer active in steam turbines will need this new edition at once, in replacement of his copy of an older edition, and this mainly because of the great extension of the chapters covering theory and experimental results. The matter on flow of steam in nozzles and buckets particularly is increased by new test data and fuller analysis. The detail study of the action of the steam in its path through the turbine, and in connection therewith the study of methods of turbine design, are greatly developed. The chief problems of structural design are discussed with ingenious adaptation of theory to the conditions of practice, and it is no great exaggeration to say that the author's treatment of critical speeds, of disk strength, of shell stress, of temperature actions in shrunk connections and the like, of labyrinth packings, of certain forms of end plates, etc., sets an approximate standard of perfection.

The section on actual examples of commercial turbines, while almost wholly new, is perhaps the least interesting part of the work in the present stage of the art. Even here the author's keen discernment, both scientific and practical, brings a constant flow of interest.

Two large-scale temperature-entropy diagrams (one for steam and one for gases), and a Mollier (heat-entropy) diagram, accompany the book in a separate case.

THE RAILWAY LIBRARY.—A Collection of Noteworthy Chapters Addresses and Papers Relating to Railways, Mostly Published during the Year 1909. Compiled and edited by Slason Thompson, Manager of the Bureau of Railway News and Statistics, Chicago. Chicago, Ill.: The Gunthorp-Warren Printing Co. Cloth; 5½ x 8¾ ins.; pp. 403.

To the future historian the legislative activities of the past five years will seem strongly overcast with railway agitation. In the light of the evidence he will then have, doubtless he will be able to decide whether this agitation, as expressed in legislation, was railway baiting or railway curbing, but we of to-day, unless we are working under a pocket-book system of philosophy, have a harder task to reach our decision. The representatives of the railways, however, have no indecision in the matter. They are vitally concerned in the future of their companies and in the effect of adverse legislation upon earnings; likewise they are men whose lives have been spent in the development of railway property. Their interests most certainly make special pleaders of them, but it cannot but be admitted

*The first three editions of this work were reviewed in this supplement for Jan. 14 and Aug. 18, 1904, and July 13, 1905. An English translation was reviewed on June 8, 1905. All four notices were prepared by the late Prof. Storm Bull.

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that their experience entitles them to speak with authority. Any one who has followed such matters in the newspapers will know that these railway officials have not been backward in giving out their views through press or from platform upon this, to them, most vital subject.

The larger part of the book noted above is made up of such papers or addresses. The authors include James J. Hill, John F. Wallace, Daniel Willard, Julius Kruttschnitt, and many others equally as prominent among railway men, and W. M. Acworth, among railway economists, but they all have the same general aim; that is, to prove that the railway is not a prodigious money earner for its stockholders, or even for the favored few among its directors or manipulators, but an ordinary business earning a moderate income and trying to do the right thing by its customers, the people.

Included with these defenses are two descriptive articles on early railroading: one on progress in railway operation and, finally, the anually published "Statistics of American Railways," which is prepared, as it has been in the past, by Mr. Slason Thompson.

Elementary Electrical Engineering for Mechanics.

ELECTRIC WIRING.—By Joseph G. Branch, B. S., M. E., Author of "Stationary Engineering," "Conversations on Electricity," "Practical Electricity," etc. Chicago, Ill.: Branch Publishing Co. Cloth; 5 × 7¾ ins.; pp. 287; 93 text illustrations. $2.

The author seems to be a firm believer in the catechistic method of instruction as an effective means of injecting technical knowledge into the mental processes of workingmen. It would seem that the catechism had reached a limit when it entirely supplants direct statement and necessitates such paragraphs as these:

Q. Why does the strength of the current depend on the quantity delivered in one second?

A. Because any current . . . does not flow all at one time, but it is a thing of duration.

Q. Explain this more fully.

. . . . . .

Q. Is the output or power (watts) of the machines affected by the method of their connection?

A. No; power (watts) is the product of volts × amperes and we have seen that connecting electrical devices in series increases the voltage, but the amperage remains the same, while connecting devices in parallel increases the amperage, the voltage remaining the same.

In the same way the work done by horses is practically the same whether they are harnessed tandem or abreast.

The method of connecting electrical devices or horses depends upon the character of the work to be done.

. . . . . .

Q. In what other ways is the escape of electricity, thereby causing much loss of power and overheating, reduced?

A. By the adoption of different kinds of wiring for different work.

Q. Under what heads can these different kinds of wiring be included?

A. Under four general heads, viz.:
1. Knob or insulator wiring.
2. Cleat work.
3. Molding work.
4. Conduit work.

In Fig. 12 is shown a knob insulator; in Fig. 13 porcelain cleats; Fig. 14, cleats carrying wires; in Fig. 15, molding carrying wires, and in Fig. 16, a conduit carrying an insulated wire.

. . . . . .

Q. How is the carrying capacity of a wire usually determined in practical work?

A. From standard tables prepared for this purpose. Such a table . . . is given on page 42, etc. . . .

Q. Explain how self induction in magnetizing coils causes current to lag. (Two-page "answer" follows.)

. . . . . .

Such indirect exposition results in a very diluted and oft repeated presentation of the most elementary things. That may be a successful way of assisting in the memorizing of definite statements of phenomena but it does not seem like an effective means of inducing the workingman to think, to plan and to understand the reasons behind the work he does, and that is the author's expressed aim.

For the most part the impressions are correct and the ideas clearly expressed. There are, however, occasional passages where a happier expression would have removed some little ambiguity. The book covers ordinary house wiring, power and railway circuits, and the elements of alternating currents.

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ADMINISTRATION REPORT ON THE RAILWAYS IN INDIA FOR THE CALENDAR YEAR 1909.—By The Railway Board. Simla, India: Pub. Doc. Stiff paper; 8½ x 13¼ ins.; pp. 345; one folding plate and two maps in pocket. 2s. 8d.; American price, $1.20.

AMERICAN MACHINIST GEAR BOOK.—Simplified Tables and Formulas for Designing, and Practical Points in Cutting All Commercial Types of Gears. By Charles H. Logue, Associate Editor "American Machinist." New York: McGraw-Hill Book Co. Cloth; 6¼ x 9¼ ins.; pp. 348; 302 text illustrations. $2.00, net.

THE AMERICAN RAILWAY ASSOCIATION.—Proceedings of the Session held at the Auditorium Hotel, Chicago, Ill., April 24, 1907, (W. F. Allen, Secy., 24 Park Place, New York City) Vol. V. New York: The Association. Cloth; 8 x 11¼ ins.; pp. 1073; numerous text illustrations. $5.

ANNUAL REPORT OF THE MINISTER OF MINES FOR THE YEAR ENDING DECEMBER 31, 1909.—Being an Account of Mining Operations for Gold, Coal, etc., in the Province of British Columbia. Printed by Authority of the Legislative Assembly of British Columbia. Victoria, B. C.: Pub. Doc. Paper; 7¼ x 10¼ ins.; pp. 298; one map; folding and other plates.

BUILDING AND BUILDING TRADES.—A Reading and Reference List of Books. Brooklyn, N. Y.: The Brooklyn Public Library. Paper; 6 x 9 ins.; pp. 20.

BULLETINS U. S. GEOLOGICAL SURVEY.—Geo. Otis Smith, Director. Washington, D. C.: Pub. Doc. Paper; 5¾ x 9 ins.

No. 381-B: Investigations of Coal Fields in Wyoming in 1908. By R. W. Stone, C. T. Lupton, H. S. Gale, C. H. Wegemann, E. G. Woodruff, M. W. Ball, Eugene Stebinger, and A. R. Schultz. Advance Chapter from Bulletin No. 381, Contributions to Economic Geology, 1908, Part II. Pp. 186; eight maps.

No. 430-F: Advance Chapter from Contributions to Economic Geology (Short Papers and Preliminary Reports), 1909. Part I.—Metals and Nonmetals, Except Fuels. Structural Materials. By E. F. Burchard, A. H. Purdee, J. A. Udden, T. N. Dale, J. H. Gardner, N. H. Darton, E. W. Shaw, W. C. Alden, E. C Harder, and F. L. Hess. Pp. 148; 5 maps and 6 text illustrations.

No. 442-A: The Mining Industry in 1909 and Alaska Coal and Its Utilization. By Alfred H. Brooks. Advance Chapter from Bulletin 442, "Mineral Resources of Alaska, 1909." Pp. 84; one map.

CONNECTICUT SOCIETY OF CIVIL ENGINEERS.—Papers and Transactions for 1909 and Proceedings of the Annual Meeting held at New Haven, Feb. 8-9, 1910. New Haven, Conn.: The Society. (J. Frederick Jackson, Secy.) Paper; 6 x 9¼ ins.; pp. 165; numerous plates and text illustrations.

DIMENSIONS OF PIPE, FITTINGS AND VALVES.—Compiled and Arranged for Engineers, Architects and Draftsmen; Also Containing Some Information on Steam Heating, Bath Room Fixtures, Etc. Third Edition. Collinwood, Ohio: The National Book Co. Cloth; 6 x 9 ins.; pp. 87; tables and numerous text illustrations. 75 cts.

DIRECTIONS FOR LIVING AND SLEEPING IN THE OPEN AIR.—By Thomas Spees Carrington, M. D. New York: The National Association for the Study and Prevention of Tuberculosis. Paper; 6 x 9 ins.; 24 illustrations.

DRAINAGE RECLAMATION IN TENNESSEE (First Papers).—Bulletin No. 3 Drainage Problems in Tennessee. By Geo. H. Ashley, State Geologist. Preliminary Report upon the Lands Overflowed by the North and Middle Forks of Forked Deer River and Rutherford Fork of the Obion River in Gibson County, Tenn. By A. E. Morgan and S. H. McCrory. The Drainage Law of Tennessee. (Senate Bill No. 229). Nashville, Tenn.: State Geological Survey. Paper; 6 x 9 ins.; pp. 91. Postage, 3 cts.

DREDGE MINING AND HYDRAULIC SLUICING.—Annual Report for the Year 1909. Victoria, Australia: Pub. Doc. Paper; 8¼ x 13 ins.; pp. 14; tables.

ELEKTROMOTORISCHE ANTRIEBE.—By B. Jacobi. Munich and Berlin: R. Oldenbourg. Cloth; 5½ x 8½ ins.; pp. 341; 172 text illustrations. 8 marks; American price, $3.50.

AN ELEMENTARY TEXT-BOOK ON MECHANICAL DRAWING.—By John E. Jagger, M. Sc. (Vic.), Whit. Sch. London, England: Charles Griffin & Co., Ltd. Philadelphia, Pa.: J. B. Lippincott Co. Cloth; 7½ x 10 ins.; pp. 251; 126 illustrations, mostly in the text. $3.50, net.

THE ESTABLISHMENT, PURPOSE, SCOPE, AND METHODS OF THE STATE GEOLOGICAL SURVEY (Tenn.)—By Geo. H. Ashley, State Geologist. Extract (A) from Bulletin No. 1, Geological Work in Tennessee. Nashville, Tenn.: State Geological Survey. Paper; 6 x 9 ins.; pp. 33. Postage, 2 cts.

EXPANSION OF PIPES.—By Ralph C. Taggart, Assoc. M. Am. Soc. C. E. With discussion by William D. Ennis, William Kent, and Ralph C. Taggart. Reprinted from "Transactions," Vol. LXX., p. 1 (1910), American Society of Civil Engineers. New York: The Author. Paper; 6 x 9 ins.; pp. 36; 31 illustrations.

FACTORY ORGANIZATION AND ADMINISTRATION.—By Hugo Diemer, M. E., Professor of Industrial Engineering, Pennsylvania State College. New York: McGraw-Hill Book Co., Cloth; 6¼ x 9¼ ins.; pp. 317; 150 text illustrations. $3, net.

GEOGRAPHY OF THE MIDDLE ILLINOIS VALLEY.—By Harlan H. Barrows. Bulletin No. 15, Illinois State Geological Survey. Urbana, Ill.: University of Illinois. Cloth; 6 x 9¼ ins.; pp. 128; 28 plates; 47 illustrations.

THE HANDY INDEX.—For Architects, Engineers, Builders and Contractors. By the Handy Index Co. New York: The author. Paper; 4¼ x 7 ins.; pp. 64. Gratis.

HIGH-SPEED STEEL.—The Development, Nature, Treatment, and Use of High-Speed Steels, Together with Some Suggestions as to the Problems Involved in Their Use. By O. M. Decker, Industrial Engineer. New York: McGraw-Hill Book Co. Cloth; 6¼ x 9¼ ins.; pp. 360; 271 text illustrations; tables and appendixes. $4, net.

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